Proceeding

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Practical analysis of power in professional footballers

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ABSTRACT

The vertical jump measure the impulsive capacity, the main goal of this study is describing the coordination and elastic and contractile components of professional soccer players when performing the power test, through jumps, made on the Axom Jump 4.0 contact platform. It is an applicative study, since it carried out a jump test which provided inputs to define the training from the evaluated athletes must do. Sample population was 9 players who acted as midfielders average age: 22 years, size: 1,77: weight: 73kg and BMI of 23.38, power was achieved through the Abalakov, SJ and CMJ jumps. The coordination and elastic influence was determined and correlated with BMI and compared with the other national and international populations. The IMB SPPS Statistics version 24 program was considered for the statistics. The assumption of normality was verified by applying the Shapiro-Wilk test and the correlation and differences with the parametric statistics were established. The power obtained was from 848,4 in the ABK, 845,0 w in the squat jump and 844,2 w in CMJ, which represents acceptable values against an international parameter. The jump valuation is related to the IE of the muscle fibres from the lower bod, and the CB which indicates the coordinative capacity of the players, the relationship of these determine the contribution of the muscle fibres, in this type of case the 9 evaluated players present very high values of muscular work or IC.

Keywords: Power; Skip ability; Power components; Individual tasks; Trainability; Sports performance.

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INTRODUCTION

There are several suggestions in order to achieve an optimal physical preparation (FP) in soccer players. These suggestions -among others-are the result of research: implementing and combining actions that involve maximum intensity with linear movements and changes of direction (Sánchez et al., 2016); including works with jumps (Loturco. et al., 2019); developing explosive strength and speed in young soccer players, since they present a correlation (Frazilli, De Arruda, Mariano & Cossio, 2011); base their physical preparation more on own play actions in both soccer and futsal (Calle, Gutiérrez & García, 2019); and to Including strength programs in young soccer players since positive effects are achieved (Sánchez-Sánchez et al., 2015).

To implement a physical preparation, it is important to understand the differences between professional soccer players and those in training ages, both in their anthropometric parameters and in the manifestations of strength and speed (Casais, Crespo, Domínguez & Lago, 2004). This can generate that the positive effects are difficult (González-Millán et al., 2014) since they report that the saltability was not improved with an 11-week strength program that did improve other variables in professional soccer players, which speaks of important levels of saltability in professional players. In the same page, no high correlations were found between maximum strength and anaerobic power tests in Argentine soccer players aged 18-20 years (Zubeldía & Cocere, 2003).

In addition to the suggestion of including jumps as a working method, the use of jumps such as CMJ (counter-movement jump) and SJ (vertical jump) is recommended for the measurement or valuation of power in several studies: Calahorro et al. (2011) present eight (8) studies in which different interventions between 6 and 16 weeks improved SJ between 2 and 31% and CMJ between 2 and 24.5%; the vertical jump as an indicator of the reactive strength in professional soccer players (Mariño, Becerra & Bugallo, 2012); after 12 weeks of strength work to check the progress of 14-20 year old players (Méndez, Márquez & Castro, 2007); to support improvements in strength using as training an isoinertial system. (Romero et al., 2014); effects of jump-based programs (Raya-González et al., 2016); with youth soccer players to verify improvements in strength with optimal weights in 8 weeks (Hernández & García. 2015); and it is even credited with the possibility that with the knowledge of its normative values explosive strength training can be properly prescribed in elite soccer players (Castagna & Castellini. 2013).

Since basic movement patterns in soccer require a high development of rapid strength and power, in addition to the ability to efficiently use the stretch-shortening cycle in ballistic movements (García, Ruiz & Latorre, 2015), measuring power with jumping is therefore very important and that is why this study aims to obtain such values in professional players of a Colombian soccer team, in order to be able to make practical recommendations about their FP.

The sample population presented the following average characteristics: age of 22.7 years, weight: 76.9 Kg and height: 1.77 cm., Power: 845 w., They have a minimum professional experience of five (5) years. The information was analysed with the SPSS 24 program, showing insignificant correlations between the power variables associated with the jumps and the BMI of the soccer players, in addition to a contractile index (CI) and contribution of the arms (CB), which allows us to propose a reform in the training methodology.

MATERIALS AND METHODS

The sample population consisted of (n = 9) professional soccer players, such sample was at the convenience of the researchers, these athletes (midfielders) participated in the study voluntarily. A protocol based on three jumps was applied: a) the CMJ, which consists of performing a concentric contraction preceded by an eccentric one which could generate higher levels of force than an isolated concentric contraction, b) the SJ is a jump without counter movement (starting from a position 90 ° flexion of the knee joint) allowing the explosive force of the lower limbs and c) the ABK, which is a jump with the help of the action of the arms, to be assessed by means of the height reached, each athlete made three attempts for each of the mentioned jumps, with an interval between 1 minute per attempt and 3 minute per jump. The jump evaluation was carried out on an Axon jump 4.0 contact platform. From each of the jumps, the average jump height is obtained and the statistics were analysed with the SPSS 24 program.

The Body Mass Index (BMI) was determined by means of the Quetelet index, the elastic index was evaluated based on the difference between the SJ and the CMJ jump; as well as lower limb muscle power using the Harman formula (Harman et al., 1991).

RESULTS

In the Table 1 is shown the jumping results of the 9 evaluated midfielders.

Table 1. Power and height reached.

ID	Weight	Size	IMC	ABK Height (m)	SJ Height (m)	CMJ Height (m)	ABK Power	SJ Power	CMJ Power	IE%	CB%	IC%
1	78	1.79	24.34	0.473	0.407	0.407	1015.3	1011.2	1011.2	0.0	16.2	83.8
2	73.4	1.83	21.91	0.441	0.392	0.389	847.7	844.7	844.5	0.9	13.5	85.6
3	72.5	1.77	23.14	0.485	0.475	0.415	818.0	817.4	813.7	-13	17	96
4	81	1.87	23.16	0.445	0.378	0.374	1121.5	1117.4	1117.2	1.0	19.0	80.0
5	69.5	1.71	23.77	0.550	0.481	0.502	714.0	709.8	711.1	-4.4	9.4	94.9
6	74	1.78	23.36	0.524	0.453	0.429	874.4	870.0	868.6	5.3	22.1	72.6
7	71.7	1.75	23.41	0.521	0.441	0.441	791.4	786.5	786.5	-0.1	18.1	82.0
8	73	1.75	23.84	0.461	0.389	0.378	834.5	830.1	829.4	2.8	22.1	75.1
9	67	1.69	23.46	0.473	0.457	0.422	619.3	618.3	616.1	7.7	12.3	80.0

Table 2. Normality of variables.

Variable	Shapiro-Wilk
Weight in Kg	.755
Size in m	.923
IMC	.240
Height in ABK	.430
Height in SJ	.283
Height in CMJ	.276
power ABK	.758
Power SJ	.750
Power CMJ	.749
Elastic Index	.236

Arms contribution	.754
Contractile Index	.451

The values obtained in Table 2 indicate that all the variables evaluated comply with the Normality assumption, therefore, the description of variables is made with the mean and standard deviation (Table 3) and the correlation of BMI with the variables of jump, power and indices is done through the Pearson Correlation. (Table 4).

Table 3. Descriptive Statistics of the variables evaluated.

Variable	Minimum	Maximum	Medium	Standard Deviation
Weight in Kg	67.0	81.0	73.344	41.726
Size in m	1.69	1.87	17.711	0.05578
IMC	21.91	24.34	233.767	0.66706
Height in ABK	0.441	0.550	0.48589	0.037807
Height in SJ	0.378	0.481	0.43033	0.039310
Height in CMJ	0.374	0.502	0.41744	0.039093
power ABK	619.3	1121.5	848.456	1.491.778
Power SJ	618.3	1117.4	845.044	1.485.460
Power CMJ	616.1	1117.2	844.256	1.488.444
Elastic Index (IE)	-13.0	7.7	0.022	59.728
Arms contribution (CB)	9.4	22.1	16.633	43.122
Contractile Index (IC)	72.6	96.0	83.333	79.575

Table 4. Correlations between power variables and BMC.

Correlation with the IMC	Height in ABK	Height in SJ	Height in CMJ	Power in ABK	Power in SJ	Power in CMJ	IE	CB	IC
Correlation	.375	.179	.276	.037	.034	.035	.052	.124	-.107
Significance	.320	.645	.472	.926	.931	.928	.894	.750	.783

There are no highly significant correlations between the BMI and the power variables of the evaluated players.

DISCUSSION

In general, the group of soccer players evaluated presented a low elastic index for the development of the vertical jump, due to the differences found both individually and in groups between the SJ and CMJ jumps, showing that for the specific case of the group, the SJ jump was the of greater height above the CMJ, while in the study carried out by (Mariño et al., 2012) the CMJ jump presented higher levels of height than the SJ.

Comparing the average values of the jumps with the values reported by sport (Chamorro et al., 2012) it is found that the a) CMJ jump is superior 35.05 cm against 41.7 cm; b) ABK jump is 42.46cm against 48.6cm and c) SJ jump is 32.54cm against 43cm. Bringing the attention on the fact that for the reference the CMJ jump is greater than the SJ, contrary to the evaluated team.

The study carried out by (Jaramillo & Jaramillo, 2019) found deficiencies in the contribution of the arms in a group of footballers belonging to a professional club from another Colombian city without presenting similarity with what was found in this study where it was acceptable with 16.6% in average.

Grande (2009) found that midfielders achieve the highest height in the CMJ jump of 40.37 ± 6.43 cm., Without being significant differences among field positions. In the present study, only midfielders with an average of 41.7 cm were evaluated. García, Ruiz & Latorre, (2015) conclude that in adolescent soccer players the differences in physical preparation are not significant, although the CMJ jump is greater in forwards and then in midfielders. above other field positions. In another study, it is found that in young women soccer players there are no differences in their abilities by positions (González-De los Reyes, Fernández-Ortega & Garavito. 2018); however, for this study carried out with players from a professional team they should have higher values, it is found: that with reference to the CMJ jump the group presented a skip of 41.7 (cm) being 1.33 cm above the results obtained in the Grande study (2009), but below the study carried out by Marek (2019) at 1.07cm.

The evaluated players are below the average in the CMJ and SJ jump to the evaluated lower divisions of another city in Colombia (Méndez, Márquez & Castro, 2007) thus CMJ: 50.21 cm against 41.7cm and SJ: 45.37 against 43cm, showing in this particular case that in the referred study the CMJ jump is superior to the SJ jump, which is precisely the aspect that casts doubt on the level of training of the athletes of the present study since their SJ jump (43 cm) on average is greater than the CMJ jump (41.7 cm); This finding is ratified by comparing it with the reported mean values for children, cadets and youth (Casais et al, 2004) for the SJ jump (26.96, 31.05 and 31.80) and the CMJ jump (36.36, 42.25 and 43.36).

CONCLUSION

The valuation of the vertical jump is directly related to the elastic index (IE) of the muscle fibres of the lower body, and the contribution of the arms (CB), which constitutes an indicator of the coordinative capacity of the players, the relationship of these components determine the contribution of the muscle fibres, in this case the 9 evaluated players present very high values of muscular work or contractility index (CI).

A change in methodology is recommended in the training of the evaluated players, given that the findings imply a poor development of the elastic and coordinative potential essential for performance in modern soccer.

The suggested proposal for fitness trainers is to include a series of strength work that especially involves the quadriceps as an important predictor of jumping ability in performance soccer players.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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